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10/810,477	03/26/2004	John F. Cooper	IL-11267	9778

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EXAMINER

CHUO, TONY SHENG HSIANG

ART UNIT	PAPER NUMBER
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1795

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11/15/2007

PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No. 10/810,477	Applicant(s) COOPER ET AL.	
	Examiner Tony Chuo	Art Unit 1795	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

- 1) ☒ Responsive to communication(s) filed on 24 September 2007.
- 2a) ☒ This action is **FINAL**. 2b) ☐ This action is non-final.
- 3) ☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

- 4) ☒ Claim(s) 1-5 and 12-24 is/are pending in the application.
- 4a) Of the above claim(s) _____ is/are withdrawn from consideration.
- 5) ☐ Claim(s) _____ is/are allowed.
- 6) ☒ Claim(s) 1-5 and 12-24 is/are rejected.
- 7) ☐ Claim(s) _____ is/are objected to.
- 8) ☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

- 9) ☐ The specification is objected to by the Examiner.
- 10) ☒ The drawing(s) filed on 26 March 2004 is/are: a) ☒ accepted or b) ☐ objected to by the Examiner.
Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).
Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).
- 11) ☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

- 12) ☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).
- a) ☐ All b) ☐ Some * c) ☐ None of:
1. ☐ Certified copies of the priority documents have been received.
 2. ☐ Certified copies of the priority documents have been received in Application No. _____.
 3. ☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

- | | |
|--|---|
| 1) <input checked="" type="checkbox"/> Notice of References Cited (PTO-892) | 4) <input type="checkbox"/> Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ |
| 2) <input type="checkbox"/> Notice of Draftsperson's Patent Drawing Review (PTO-948) | 5) <input type="checkbox"/> Notice of Informal Patent Application |
| 3) <input type="checkbox"/> Information Disclosure Statement(s) (PTO/SB/08)
Paper No(s)/Mail Date _____ | 6) <input type="checkbox"/> Other: _____ |

DETAILED ACTION

Response to Amendment

1. Claims 1-5 and 12-24 are currently pending. New claims 21-24 have been added. The amended claim 1 does overcome the 112, 1st paragraph rejection of claims 1-5 and 12-14. However, claims 15-20 stand rejected under the previous 112, 1st paragraph rejection. The amended do overcome the previous 112, 2nd paragraph rejections of claims 1-5 and 12-20. Claims 15-20 do not overcome the previous 102 and 103 rejections. Therefore, claims 15-20 stand rejected under the following 102 and 103 rejections. Claims 1-5 and 12-14 do overcome the previous 102 and 103 rejections. However, upon further consideration, claims 1-5, 12-14, and 21-24 are rejected under the following new 103 rejections. This action is made FINAL as necessitated by the amendment.

Claim Rejections - 35 USC § 112

2. The following is a quotation of the first paragraph of 35 U.S.C. 112:

The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

3. Claims 15-20 and 24 are rejected under 35 U.S.C. 112, first paragraph, as failing to comply with the written description requirement. The claim(s) contains subject matter which was not described in the specification in such a way as to reasonably convey to one skilled in the relevant art that the inventor(s), at the time the application was filed,

had possession of the claimed invention. The terms "wetable aerogel/carbon composite" and "wetable xerogel/carbon composite" are not supported by the specification.

Claim Rejections - 35 USC § 102

4. The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that form the basis for the rejections under this section made in this Office action:

A person shall be entitled to a patent unless –

(b) the invention was patented or described in a printed publication in this or a foreign country or in public use or on sale in this country, more than one year prior to the date of application for patent in the United States.

5. Claims 15 and 20 are rejected under 35 U.S.C. 102(b) as being anticipated by Petricevic et al ("Planar fibre reinforced carbon aerogel for application in PEM fuel cells", Carbon, vol. 39, no. 6, May 2001, pg. 857-867).

The Petricevic reference discloses a fiber reinforced carbon aerogel that is produced by the process comprising: providing a solution of organic precursor aerogel that includes resorcinol and formaldehyde; adding a ceramic fibre or carbon fibre to the precursor to form a precursor mixture; gelling the precursor mixture; drying the composite gel in air; and pyrolyzing the composite gel to form an aerogel/carbon composite (See Experimental). It also discloses a catalyst that is sodium carbonate (See Introduction). It also discloses RF aerogels that are wettable depending on the hydrophilic character of the reinforcement fibers (See Section 3.2).

Examiner's note: The recitations "anode" & "fuel" have not been given patentable weight because the recitations occur in the preamble. A preamble is

generally not accorded any patentable weight where it merely recites the purpose of a process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951). In addition, it is inherent that the pyrolyzing step taught by Petricevic et al will produce a composite comprising chars being fuel capable of being combusted in a molten salt electrochemical fuel cell in the range from 500°C to 800°C to produce electrical energy. Further, the limitation in claim 20 is not given patentable weight because claim 15 is interpreted as forming an aerogel/carbon composite. Therefore, claims 15 and 20 do not require the limitations of a xerogel/carbon composite.

Claim Rejections - 35 USC § 103

6. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

(a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negated by the manner in which the invention was made.

7. Claims 1, 3, 5, 14, and 24 are rejected under 35 U.S.C. 103(a) as being unpatentable over Petricevic et al ("Planar fibre reinforced carbon aerogel for application in PEM fuel cells", Carbon, vol. 39, no. 6, May 2001, pg. 857-867) in view of Gartside et al (US 5866745).

The Petricevic reference discloses a fiber reinforced carbon aerogel that is produced by the process comprising: providing a solution of organic precursor aerogel that includes resorcinol and formaldehyde; adding a ceramic fibre or carbon fibre to the precursor to form a precursor mixture; gelling the precursor mixture; drying the composite gel in air; and pyrolyzing the composite gel to form an aerogel/carbon composite (See Experimental). It also discloses a catalyst that is sodium carbonate which inherently would be present during the pyrolyzing step (See Introduction).

Examiner's note: The scope of claim 1 has changed because previously claim 1 was construed as comprising a catalyst that is an alkali carbonate based upon the limitation of claim 14. Presently, claim 1 is construed as comprising a catalyst that is a transition metal oxide.

However, Petricevic et al does not expressly teach a transition metal oxide catalyst. The Gartside reference discloses solids that are characterized by the catalytic oxides of the group IVB, VB, or VIB transition metals including vanadium, titanium, zirconium, or tungsten for promoting pyrolysis (See column 5, lines 1-6).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Petricevic reinforced carbon aerogel to include a transition metal oxide catalyst in order to enhance the rate of the pyrolysis reaction (See column 3, lines 40-44).

Examiner's note: The recitations "anode" & "fuel" have not been given patentable weight because the recitations occur in the preamble. A preamble is generally not accorded any patentable weight where it merely recites the purpose of a

process or the intended use of a structure, and where the body of the claim does not depend on the preamble for completeness but, instead, the process steps or structural limitations are able to stand alone. See *In re Hirao*, 535 F.2d 67, 190 USPQ 15 (CCPA 1976) and *Kropa v. Robie*, 187 F.2d 150, 152, 88 USPQ 478, 481 (CCPA 1951). In addition, it is inherent that the pyrolyzing step taught by Petricevic et al will produce a composite comprising chars being fuel capable of being combusted in a molten salt electrochemical fuel cell in the range from 500°C to 800°C to produce electrical energy.

8. Claims 2 and 12 are rejected under 35 U.S.C. 103(a) as being unpatentable over Petricevic et al ("Planar fibre reinforced carbon aerogel for application in PEM fuel cells", Carbon, vol. 39, no. 6, May 2001, pg. 857-867) in view of Gartside et al (US 5866745) as applied to claim 1 above, and further in view of Erkey et al (US 2004/0029982).

However, Petricevic et al as modified by Gartside et al does not expressly teach a drying step that is accomplished by supercritical-critical solvent extraction; and composites that have a density of at least 0.56 grams/cm³. The Erkey reference discloses an resorcinol formaldehyde aerogel that is formed by a drying step under supercritical conditions; and an aerogel that has a density from about 0.01 to 2.0 grams/cm³ (See paragraphs [0021],[0022],[0029] and Table 1).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Petricevic/Gartside reinforced carbon aerogel to include a drying step that is accomplished by supercritical-critical solvent extraction; and composites that have a density of at least 0.56 grams/cm³ in order to preserve the gel

skeleton and minimize shrinkage during drying while maintaining sufficient density for use as an fuel cell electrode.

9. Claim 4 is rejected under 35 U.S.C. 103(a) as being unpatentable over Petricevic et al ("Planar fibre reinforced carbon aerogel for application in PEM fuel cells", Carbon, vol. 39, no. 6, May 2001, pg. 857-867) in view of Gartside et al (US 5866745) as applied to claim 1 above, and further in view of Stepanian et al (US 2002/0094426).

However, Petricevic et al as modified by Gartside et al does not expressly teach ceramic materials that are selected from the group consisting of silica, alumino-silicates, and ash derived from coal or petroleum clays. The Stepanian reference discloses an aerogel composite comprising an aerogel matrix such as organic aerogels made from resorcinol formaldehydes and reinforcing fibers such as silica fibers (See paragraph [0013],[0029]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Petricevic/Gartside reinforced carbon aerogel to include ceramic materials that are selected from the group consisting of silica, alumino-silicates, and ash derived from coal or petroleum clays in order to improve the durability and thermal and/or electrical conductivity of the aerogel (See paragraph [0012]).

10. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Petricevic et al ("Planar fibre reinforced carbon aerogel for application in PEM fuel cells", Carbon, vol. 39, no. 6, May 2001, pg. 857-867) in view of Gartside et al (US 5866745) as applied to claims 1 and 5 above, and further in view of Rhine et al (US 2004/0132845).

However, Petricevic et al as modified by Gartside et al does not expressly teach carbon materials that comprise graphite. The Rhine reference discloses a carbon aerogel that comprises reinforcement agents such as graphite fibers (See paragraph [0097]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Petricevic/Gartside reinforced carbon aerogel to include carbon materials that comprise graphite in order to increase the mechanical strength of the base aerogel composition as well as to increase the electrical conductivity of the aerogel.

11. Claims 16-18 and 21-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Petricevic et al ("Planar fibre reinforced carbon aerogel for application in PEM fuel cells", Carbon, vol. 39, no. 6, May 2001, pg. 857-867) in view of Erkey et al (US 2004/0029982). The Petricevic reference is applied to claim 15 for reasons stated above.

However, Petricevic et al does not expressly teach composites that have a density of at least 0.56 grams/cm³; a mole ratio of phenolic resin, resorcinol or catechol to catalyst that is less than about 50 to 1; a mole ratio of the resorcinol to catalyst that is less than or about 50 to 1; and pyrolyzing that forms a xerogel/carbon composite. The Erkey reference discloses an resorcinol formaldehyde aerogel that is formed by a drying step under supercritical conditions; an aerogel that has a density from about 0.01 to 2.0 grams/cm³; and a mole ratio of resorcinol to catalyst that is about 50 to 1 (See paragraphs [0021],[0022],[0029] and Table 1). In addition, it also teaches that if the

polymerization solvent is removed from these gels by simple evaporation, large capillary forces are exerted on the pores, forming a collapsed structure, i.e. xerogel (See paragraph [0022]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Petricevic reinforced carbon aerogel to include composites that have a density of at least 0.56 grams/cm^3 ; a mole ratio of phenolic resin, resorcinol or catechol to catalyst that is less than about 50 to 1; a mole ratio of the resorcinol to catalyst that is less than or about 50 to 1; and pyrolyzing that forms a xerogel/carbon composite in order to control the surface area and electrochemical properties of the resulting gel and to form a dense xerogel/carbon composite suitable for a particular application.

12. Claim 19 is rejected under 35 U.S.C. 103(a) as being unpatentable over Petricevic et al ("Planar fibre reinforced carbon aerogel for application in PEM fuel cells", Carbon, vol. 39, no. 6, May 2001, pg. 857-867) in view of Rhine et al (US 2004/0132845). The Petricevic reference is applied to claim 15 for reasons stated above.

However, Petricevic et al does not expressly teach carbon materials that comprise graphite. The Rhine reference discloses a carbon aerogel that comprises reinforcement agents such as graphite fibers (See paragraph [0097]).

Therefore, it would have been obvious to one of ordinary skill in the art at the time the invention was made to modify Petricevic reinforced carbon aerogel to include carbon materials that comprise graphite in order to increase the mechanical strength of

the base aerogel composition as well as to increase the electrical conductivity of the aerogel.

Response to Arguments

13. Applicant's arguments filed 9/24/07 have been fully considered but they are not persuasive.

The applicant argues that the method of preparation of the applicant's monolith and fuel as well as the finished product is not disclosed or suggested in Petricevic. As previously stated, the examiner contends that the fuel that is formed in the finished product is inherently formed by the pyrolysis step. By definition, pyrolysis is the chemical decomposition of organic materials by heating in the absence of oxygen. In fact, the applicant discloses in the specification of the present application that in general, "pyrolyzing plastics causes the plastics to thermally decompose and produce carbon chars". In fact, both applicant's finished product and Petricevic's finished product are formed from the same precursor of resorcinol and formaldehyde which further proves that chars will be formed during the Petricevic's pyrolysis step. Therefore, the examiner maintains the assertion that chars are necessarily formed during Petricevic's pyrolysis step.

The applicant also argues that Petricevic fails to disclose performing pyrolysis in the presence of any of the listed materials in claim 14. The examiner disagrees because Petricevic et al discloses adding sodium carbonate to the precursor of resorcinol and formaldehyde. Therefore, it is contended by the examiner that the

sodium carbonate is still remaining in the composite gel during the pyrolysis step since it is used only as a catalyst.

The applicant also argues that nowhere does Petricevic teach or suggest that the disclosed structures are suitable for use as an anode with wettable chars being fuel capable of being combusted in a molten salt electrochemical fuel cell in the range from 500C to 800C to produce electrical energy. The applicant further argues that the most obvious difference between the two products is that the applicant's product is wettable and Petricevic product is hydrophobic.

- Firstly, the arguments that the applicant's product has to be wettable are not commensurate with the scope of the claims because the claims do not require that the finished product or the chars are wettable. Nowhere in the specification of the present application is disclosed that the final product or the chars are wettable. Therefore, the limitations of wettable aerogel/carbon composite or wettable xerogel/carbon composite are not supported by the specification.
- Secondly, the applicant tries to show the criticality of the hydrophobicity of the Petricevic product by using the US Patent No. 6,503,655 to Petricevic et al. However, there is no evidence to show that the product disclosed in US Patent 6,503,655 is the same as the product disclosed in Petricevic et al ("Planar fibre reinforced carbon aerogel for application in PEM fuel cells", Carbon, vol. 39, no. 6, May 2001, pg. 857-867).

- Thirdly, there is no evidence to show that the product disclosed by Petricevic is entirely hydrophobic. In fact, many of the materials used for reinforcing the carbon aerogel are hydrophilic.
- Lastly, there is no evidence to show that the reinforced carbon aerogel taught by Petricevic cannot be used as an anode with wettable chars being fuel capable of being combusted in a molten salt electrochemical fuel cell in the range from 500C to 800C to produce electrical energy. Since the claims do not require a molten salt fuel cell, the examiner maintains the assertion that the Petricevic carbon aerogel is capable of being used as an anode in a molten salt fuel cell based upon the facts stated above.

Conclusion

Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire **THREE MONTHS** from the mailing date of this action. In the event a first reply is filed within **TWO MONTHS** of the mailing date of this final action and the advisory action is not mailed until after the end of the **THREE-MONTH** shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of

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the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Tony Chuo whose telephone number is (571) 272-0717. The examiner can normally be reached on M-F, 7:00AM to 3:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Patrick Ryan can be reached on (571) 272-1292. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see <http://pair-direct.uspto.gov>. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

TC


JONATHAN CREPEAU
PRIMARY EXAMINER